CASSIN'S AUKLET (*Ptychoramphus aleuticus*)

Josh Adams, Moss Landing Marine Laboratories, 8272 Moss Landing Rd., Moss Landing, CA 95039

Criteria Scores

Population Trend	Range Trend	Population Size	Range Size	Endemism	Population Concentration	Threats
15	5	5	0	0	10	5

Special Concern Priority

Currently considered a Bird Species of Special Concern (breeding), Priority 2. Not included on the original prioritized list (Remsen 1978) or on CDFG's (1992) unprioritized list.

Breeding Bird Survey Statistics for California

Data inadequate for trend assessment (Sauer *et al*. 2000).

General Range and Abundance

Mostly confined to the northeastern Pacific Ocean, rare to the Kuril Islands (Manuwal and Thoresen 1993). Comprised of two recognized subspecies: *P. aleuticus aleuticus* occurs in California north to the Bering Sea, Alaska. Slightly smaller *P. a. australis* occurs in northern Baja California, Mexico (Manuwal and Thoresen 1993). In North America breeds colonially on offshore islands and isolated islets. Greatest abundance occurs in the Scott Island group off British Columbia, Canada (*ca*. 2 million birds; Rodway *et al.* 1992). Scattered small colonies found through southeast Alaska and northwest along the Alaska Peninsula, and south along the coast of Oregon and Washington. California subpopulation consists of 16 documented colonies (53,562 breeding birds in 1991) with three (Castle Rock, Del Norte County; Southeast Farallon Island [SEFI], San Francisco County; and Prince Island, Santa Barbara County) representing 10%, 68%, and 16% of the California breeding population, respectively (Carter *et al.* 1992).

Seasonal Status in California

Cassin's Auklet is one of the most abundant breeding seabird species in California. Occurs in offshore California waters year-round (Briggs *et al.* 1987). Overall, greatest numbers occur in the non-breeding season (September – February); thought to include many migrant birds from British Columbia and Alaska (Briggs *et al.* 1987). California breeders thought to reside near colonies during the non-breeding season (Briggs *et al.* 1987, Manuwal and Thoresen 1993) Recent colony-specific information from adults radio-marked in southern California indicates northward post-breeding dispersal to areas off central and northern California (Adams *et al*. 2000). May attend colonies sporadically during any month of the year (SEFI; Ainley *et al*. 1990). Dispersion at sea becomes increasingly clumped during early spring as birds attend colonies more regularly; breeding birds primarily concentrated within 50 km of colonies during incubation and chick-rearing (Hunt *et al.* 1981, Briggs *et al.* 1987, Allen 1994, Adams *et al.* 2000); breeding season is variable, generally earlier in southern California and extends from January – August statewide.

Historical Range and Abundance in California

Few surveys to quantify the abundances of auklets on offshore islands exist prior to the 1950s (summarized in Hunt *et al.* 1981, and Ainley and Lewis 1974); Grinnell (1897) and Robertson (1903) documented a large colony of Cassin's Auklets on Santa Barbara Island, California Channel Islands during visits in 1897 and 1899, but with the introduction of cats about 1900 the auklet colony was destroyed by 1908 (Howell 1917). The last cat was removed in 1978, small numbers of auklets persisted on Sutil Island off Santa Barbara Island (Hunt *et al.* 1981) and there were low numbers breeding on Santa Barbara Island in 1991 (Carter *et al.* 1992).

Recent Range and Abundance in California

The overall distribution of colonies with in California remains essentially unchanged during historic times (Manuwal and Thoresen 1993); however, overall population abundance is believed to fluctuate on decadal time scales (Ainley and Manuwal history paper) associated with changes in the

marine climate of the California Current system. Allen (1994), and Oedocoven *et al.* (2001) measured interannual trends in abundances (densities) at sea. Trend in at-sea densities suggest a dramatic decline occurred from 1989 to 1994. Colony-based assessments of nesting auklets have been conducted periodically in California by various researchers (Sowls et al. 1980, Hunt *et al.*1981, Carter *et al.* 1992). The total California population based on surveys conducted during 1989 – 1992, was estimated at 53,562 birds breeding at 16 colonies (Carter *et al.* 1992).

Northern California. Largest colony (5600 birds in 1989; Carter *et al.* 1992) occurs on Castle Rock, Del Norte County. This colony is thought to have increased in abundance since 1959 when 100 birds were estimated. Highest burrow density thought to be associated with *Elymus mollis* vegetation (Osborne 1972). Small numbers of birds also occur on Green Rock (84 birds; Carter et al 1992) and possibly small numbers on Fish Rocks, Mendocino County (Carter *et al.* 1992).

Central California. The largest colony of breeding Cassin's Auklets in California occurs on the South Farallon Islands National Wildlife Refuge (SEFI; 38,274 birds in 1989; Carter *et al*. 1992). Numbers of birds breeding in monitored study plots have decreased significantly (2.8% decline per year from 1987 – 1999) coincident with an increase in the mean age at first breeding, indicating subpopulation level stress at SEFI (Pyle 2001).

Southern California. Largest colony (8, 922 birds in 1991) occurs on Prince Island, San Miguel Island followed by Castle Rock, San Miguel Island (2,614 birds in 1991). Cassin's Auklet nests in scattered low numbers on other small islands throughout the northern Channel Islands. Numbers of breeding and potential breeding birds likely reduced on Anacapa Island by presence of large numbers of introduced black rats (*Rattus rattus*; McChesney *et al.* 2000). Formerly nested in a "large" colony on Santa Barbara Island, but decimated by introduced cats (*Felis catus*; now extirpated) Santa Barbara Island colony has been slow to recover likely due to low recruitment to the population resulting from warm ocean climate conditions (McGowan *et al.* 1998) combined with additional mortality likely associated with past oil spills in southern California (e.g., 1969

Platform A Oil Spill, September 1997 *Torch* Oil Spill), and given recent evidence for northward postbreeding dispersal (Adams *et al.* 2000), perhaps spills in northern California as well (i.e., November 1984 *Puerto Rican* Oil Spill; Ford *et al.* 1987, and the February 1986 *Apex Houston* Oil Spill; Page *et al.* 1990, and the ongoing, recently identified *S. S. Jacob Luckenbach* spills).

Ecological Requirements

During nesting, requires islands free from non-native predators including cats and rats, and large mammals (cattle, sheep, pigs, goats) that could trample fragile burrows and destroy vegetation essential for stabilizing soil required for burrowing. Throughout its range nests in earthen burrows excavated by adults or in rocky crevices apparently when soil conditions are inadequate for burrowing. In California, trend is for higher proportion of burrows in the north trending to a higher proportion of crevices used in the south (Carter *et al.* 1992). Also readily nests in artificial nest boxes (SEFI; Ainley *et al*. 1990, and Prince Island; Adams *et al.* 2000) and in artificial burrows (Prince Island and Scorpion Rock; Adams *et al.* 2000). Highest burrow densities in soil protected by native vegetation (Farallon weed on SEFI; Ainley *et al*. 1990, and *Opuntia* on Prince Island (Hunt *et al.* 1981).

At-sea auklets are associated with the subarctic waters of the inner California Current, influenced by seasonal upwelling; specifically areas of bathymetric relief such as the continental shelf break (200 m isobath; Allen 1994, Oedekoven *et al.* 2001, Adams *et al.* 2000) and in vicinity of coastal promontories (Pt. Reyes, Pt. Sur, Pt. Conception) and over the continental shelf where prey may be concentrated along recurring and predictable oceanographic fronts. Adults take and provision chick with crustaceans (primarily Euphausacea: *Thysanoessa spinifera* and *Euphausia pacifica*, amphipods), and age-0 fishes (*Sebastes spp*., Pleuronectidae, Bothidae, Clupiidae, and several others), and squid (Hunt *et al.* 1993, Sydeman *et al*. 2001); fish component apparently more important in the Channel Islands (Hunt *et al.* 1993, Adams *et al.* unpublished data) than at SEFI (Ainley *et al*. 1990, 1996, Sydeman *et al.* 2001).

Threats

Flocking behavior and aggregation at sea causes auklets to be extremely vulnerable to oil spills or oil platform blowouts (Nisbet 1994, Carter *et al.* 2000). Assessing mortality associated with spills is problematic for Cassin's Auklet because there is a low potential for the recovery of small, dead

oiled alcids such as murrelets and auklets (Carter *et al.* 2000). Extremely vulnerable to mammals introduced on islands (*i.e.* rats on Anacapa Island, and cats formerly on Santa Barbara Island; McChesney and Tershy 1998). Easily disoriented by bright lights at sea, especially near colonies (Dawson 1923, J. Adams personal observation). Increased ambient light levels at colonies during the breeding season dramatically decrease auklet activity such as calling and surface exploration (Ainley *et al*. 1990). Artificially elevated light levels near colonies may increase this species' vulnerability to native avian predators (gulls, owls, peregrine falcons). Non-native, invasive plants (*i.e*., *Malva, Urtica, Carpobrotus, Mesembryanthemum*) may displace native island flora (*Lasthenia minor maritima*; SEFI) and facilitate enhanced erosion rates and ultimately degrade limited nesting habitat or prevent birds from obtaining optimal nesting habitat. However, in some cases non-native vegetation may help to stabilize soils and benefit burrowing auklets (Año Nuevo Island). Increasing recreational use in waters near nesting colonies (Ainley and Hunt 1991) increases the risk of visitation to sensitive colonies (Channel Islands, southern California).

Management and Research Recommendations

- Continue to eradicate introduced, non-native rats from the California Channel Islands
- Enhance preventative measures through education that decrease the probability of introducing non-native mammals (rodents, rabbits, cats, etc.) to islands; provide or require 'rat-spill' kits and contingency plans in the event of a potential spill to marine vessels that frequent offshore islands, and to the islands themselves
- Control or eradicate invasive plant species on islands (Prince Island) and restore native vegetation to breeding colonies (Año Nuevo Island, Scorpion Rock) to prevent habitat loss and facilitate nesting.
- Restrict human access to islands with known colonies (especially southern California)

- Restrict the use of bright lights (i.e., light boats and seining vessels associated with the California squid fishery, California Channel Islands) in the vicinity of colonies, especially during the nesting season (Spring – Summer), when bright lights may disrupt breeding activities, and attract auklets and other sensitive seabirds to vessels where they may be injured or killed.

Monitoring Needs

It is important to continue population monitoring at primary colonies in California (Castle Rock (Del Norte County, Southeast Farallon Island, Prince Island) to detect population trends. Post-breeding telemetry studies are required to further understand colony-specific movements, marine habitat associations, at-sea threats, and subpopulation mixing during the non-breeding (Fall – Winter season). Information derived from telemetry combined with stratified-random at-sea survey designs (Jolly and Hampton 1990) may provide a powerful technique to more accurately estimate population sizes and trends for a species that is inherently difficult to census at breeding colonies (Carter *et al.* 1992). Monitor the effects on seabirds of artificial light at-sea near breeding colonies and at the colonies themselves (Channel Islands).

Acknowledgments

Literature Cited

Adams, J, Takekawa, J. Y., and Carter, H. R. 2000. Foraging distribution and movement patterns of Cassin's Auklets nesting at Prince Island, California. *In* Orthmeyer, D. L., Carter, H. R., Takekawa, J. Y., and Golightly, R. T. (eds.) 2000. At-sea distribution of seabirds and marine mammals in the Southern California Bight. Unpublished progress report. U. S. Geological Survey, Western Ecological Research Center, Dixon and Vallejo, California, and Humboldt State University, Department and Wildlife, Arcata, CA. pp.88 – 117.

Ainley, D. G., and Lewis, T. J. 1974. The history of Farallon Island marine bird populations, 1854-1972. Condor 76:432-446.

Ainley, D. G., Boekelheide, R. J., Morrell, S. H., and Strong, C. S. 1990. Cassin's Auklet, Chapter IV In Ainley, D. J., and Boekelheide, R. J. (eds). Seabirds of the Farallon Islands: Ecology, dynamics, and structure of an upwelling-system community. Stanford University Press, Palo Alto, CA. pp 306-338.

Ainley, D. J., and Hunt, G. L. Jr. 1991. Status and conservation of seabirds in California. In Croxall, J. P. (ed.) Seabird status and conservation: A supplement. International Council for Bird Preservation, Technical Publication No. 11, Cambridge, U. K. pp103-114.

Ainley, D. G., Spear, L. B., and Allen, S. G. 1996. Variation in the diet of Cassin's Auklet reveals spatial, seasonal, and decadal occurrence patterns of euphausiids off California, USA. Mar. Ecol. Prog. Ser. 137:1-10.

Allen, S. G. 1994. The distribution and abundance of marine birds andmammals in the Gulf of the Farallones and adjacent waters, 1985 – 1992. PhD dissertation, University of California, Berkeley.

Briggs, K. T., Tyler, W. B., Lewis, D. B., and Carlson, D. R. 1987. Bird communities at sea off California: 1975-1983. Studies in Avian Biology 11.

Carter, H. R., McChesney, G. J., Jaques, D. L., Strong, C. S., Parker, M. W., Takekawa, J. E., Jory, D. L., and Whitworth, D. L. 1992. Breeding populations of seabirds in California 1989 – 1991, Vol. I – Population Estimates. Unpublished Draft Final Report no.14-12-001-30456, U. S. Minerals Management Service, Pacific OCS Region, Camarillo, CA.

Carter, H. R., Whitworth, D. L., Takekawa, J. Y., Keeney, T. W., and Kelly, P. R. 2000. At-sea threats to Xantus's Murrelets (Synthliboramphus hypoleucus) in the Southern California Bight. Pages 435-447 *In* D. R. Browne, K. L. Michell, and H. W. Chaney (eds.) Proceedings of the fifth California Islands Symposium. 29 March to 1 April 1999, Santa Barbara Museum of Natural History, Santa Barbara, CA. U.S. Minerals Management Service, Pacific OCS Region, Camarillo, CA. [Available on CD-ROM.]

Dawson, W. L. 1923. The birds of California. South Moulton Co., San Diego. pp.1467-1473.

Ford, R. G., Page, G. W., and Carter, H. R. 1987. Estimating of mortality of seabirds from oil spills. Proceedings of the 1987 Oil Spill Conference, American Petroleum Institute, Washington, D. C. pp.747-751.

Grinnell, J. 1897. Report on the seabirds recorded during a visit to the islands of Santa Barbara, San Nicolas and San Clemente, in the Spring of 1897. Pasadena Academy of Sciences, Publication No. 1

Howell, A. B. 1917. Birds of the islands off the coast of southern California. Pacific Coast Avifauna 12.

Hunt, G. L. Jr., Pitman, R. L., Naughton, M., Winnet, K., Newman, A., Kelly, P. R., and Briggs, K. T. 1981. Summary of marine mammals and seabird surveys off the southern California Bight area, 1975-1979. Vol 3. Investigators repors, pt. 3: Seabirds of the southern California Bight, book 2: Distribution, status, reproductive biology, and foraging habits of breeding seabirds. Report to Bureau of Land Management, Regents of the University of California, Irvine.

Hunt, G. L. Jr., Harrison, N. M., and Piatt, J. F. 1993. Foraging ecology as related to the distribution of planktivorous auklets in the Bering Sea. In Vermeer, K., Briggs, K. T., Morgan, K. H., and Siegel-Causey (eds.) The status, ecology, and conservation of marine birds of the North Pacific. Canadian Wildlife Service, Ottawa.

Jolly, G. M. and Hampton, I. 1990. A Stratified random transect design for acoustic surveys of fish stocks. Can. J. Fish. Aquat. Sci. 47: 1281-1291.

Manuwal, D. A., and Thoresen, A. C. 1993. Cassin's Auklet (*Ptychoramphus aleuticus*), in The Birds of North America, No. 50, (A. Poole and F. Gill, eds.). Acad. Nat. Sci., Philadelphia.

McChesney, G. J., and Tershy, B. R. 1998. History and status of introduced mammals and impacts to breeding seabirds on the California Channel and northwestern Baja California islands. Colonial Waterbirds 21(3): 335-347.

McChesney, G. J., Gress, F., Carter, H. R., and Whitworth, D. L. 2000. Nesting habitat assessment for Xantus' Murrelets and other crevice-nesting seabirds at Anacapa Island, California, in 1997. Unpublished report, U.S. Geological Survey, Western Ecological Research Center, Dixon, CA; and Department of Wildlife, Humboldt State University, Arcata, California. 34 pp.

McGowan, J. A., Cayan, D. R., and Dorman, L. M. 1998. Climate-ocean variability and ecosystem response in the northeast Pacific. Science 281: 210-217.

Nisbet, I. C. T. 1994. Effects of pollution on marine birds. In Nettelship, D. N., Burger, J. and Gochfeld, M. (eds.) Seabirds on islands: threats, case studies and action plans. Proceedings of the Seabird Specialist Group Workshop, XX World Conference of the International Council for Bird Preservation, University of Waikato, Hamilton, New Zealand, 1990. BirdLife Concervation Series No. 1. pp.8-25.

Oedekoven, C. S., Ainley, D. G., and Spear, L. B. 2001. Variable responses of seabirds to change in marine climate: California Current, 1985-1994. Mar. Ecol. Prog. Ser. 212: 265-281.

Osborne, T. O. 1972. Ecology and avian use of the coastal rocks in northern California. Unpublished M. A. Thesis, Humboldt State University, Arcata, California.

Page, G. W., Carter, H. R., and Ford. R. G. 1990. Numbers of seabirds killed or debilitated in the 1986 Apex Houston Oil Spill in central California. Studies in Avian Biology 14: 164-174.

Pyle, P. 2001. Age at first breeding and natal dispersal in a declining population of Cassin's Auklet. Auk 118(4):996-1007.
Robertson, H. 1903. Cassin's Auklet, *Ptychoramphus aleuticus*. Condor 5: 96-97.

Rodway, M. S., Lemon, M. J. F., and Summers, K. R. 1992. Seabird breeding populations in the Scott Islands on the west coast of Vancouver Island, 1982 – 1989. In Vermeer, K. R., Butler, W., Morgan, K. H. (eds.). The ecology, status and conservation of marine and shoreline birds on the west coast of Vancouver Island. Occasional Paper No. 75, Canadian Wildlife Service, Ottawa.

Sauer, J. R., Hines, J. E., Thomas, I., Fallon, J., and Gough, G. 2000. The North American Breeding Bird Survey, results and analysis 1966-1999. Version 98.1, USGS Patuxent Wildl. Res. Ctr., Laurel MD (http://www.mbr-pwrc.usgs.gov/bbs/bbs.html).

Sowls, A. L., Degange, A. R., Nelson, J. W., and Lester, G. S. 1980. Catalog of California seabird colonies. U. S. Fish and Wildlife Service. FWS/OBS-80/37.

Sydeman, W. J., Hester, M. M., Thayer, J. A., Gress, F., Martin, P., and Buffa, J. 2001. Climate change, reproductive performance and diet composition of marine birds in the southern California Current system, 1969-1997. Progress in Oceanography 49: 309-329.